

its depression below the dry bulb are the fundamental data for all investigations into the relation between human physiology and the atmosphere. In order to present a monthly summary of the atmospheric conditions from a hygienic and

physiological point of view, Table VIII has been prepared, showing the maximum, minimum, and mean readings of the wet-bulb thermometer at 8 a. m. and 8 p. m., seventy-fifth meridian time.

PRECIPITATION.

[In inches and hundredths.]

The *distribution of precipitation* for the month of February, 1895, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The precipitation was greatest, 8 to 10 inches, in the northwest corner of Washington, and least, averaging less than 1 inch, throughout the watersheds of the Ohio, Missouri, and Upper Mississippi.

The *diurnal variation* is shown by Table XII, which gives the total precipitation for each hour of seventy-fifth meridian time, as deduced from self-registering gauges kept at about 43 regular stations of the Weather Bureau; of these 37 are float gauges and 6 are weighing gauges.

The *normal precipitation* for each month is shown in the Atlas of Bulletin C, entitled "Rainfall and Snow of the United States, compiled to the End of 1891, with Annual, Seasonal, Monthly, and other Charts."

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was deficient over nearly the whole of the United States. It was, however, in excess in several small regions, viz: from Port Eads and the coast of Texas over central Texas, eastern New Mexico, Kansas, western Colorado, Nebraska, and South Dakota as far north as Pierre; in Montana, Assiniboia, and Alberta as far north as Edmonston; on the south Atlantic coast from Charleston to Jacksonville, and in isolated places such as Tatoosh Island, Carson City, Fresno, Father Point, Chatham, Titusville, and Key West.

The *average departure* for each district is also given in Table I. By dividing these by the respective normals the following corresponding percentages are obtained (precipitation is in excess when the percentages of the normal exceeds 100):

Above the normal: Key West, 152; northern slope, 141; middle slope, 181; Abilene (southern slope), 207.

Below the normal: New England, 28; middle Atlantic, 40; south Atlantic, 89; east Gulf, 62; west Gulf, 64; Ohio Valley and Tennessee, 24; Lower Lake, 41; Upper Lake, 50; North Dakota, 67; Upper Mississippi, 26; Missouri Valley, 39; southern plateau, 54; middle plateau, 92; northern plateau, 80; north Pacific, 56; middle Pacific, 54; southern Pacific, 39.

The *years of greatest and least precipitation* are given in the REVIEW for February, 1894. The precipitation for the current month was the least on record for the month of February at most regular Weather Bureau stations in the Atlantic States and Ohio Valley, Missouri, Arkansas, and Louisiana.

The *total accumulated monthly departures* from normal precipitation from the beginning of the year to the end of the current month are given in the second column of the following table; the third column gives the ratio of the current accumulated precipitation to its normal value.

| Districts. | Accumulated departures. | Accumulated precipitation. | Districts. | Accumulated departures. | Accumulated precipitation. |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|----------------------------|-------------------------------|
| | Inches. | Per ct. | | Inches. | Per ct. |
| New England | 3.10 | 63 | South Atlantic | 1.50 | 119 |
| Middle Atlantic | 1.00 | 86 | Key West | 2.10 | 156 |
| East Gulf | 2.20 | 80 | Northern slope | 0.30 | 128 |
| West Gulf | 2.60 | 65 | Middle slope | 0.30 | 120 |
| Ohio Valley and Tennessee | 2.40 | 73 | Southern slope (Abilene) | 1.40 | 168 |
| Lower Lakes | 1.40 | 74 | Middle plateau | 1.00 | 135 |
| Upper Lakes | 0.40 | 90 | Middle Pacific | 0.80 | 108 |
| North Dakota | 0.20 | 84 | South Pacific | 2.30 | 162 |
| Upper Mississippi | 1.80 | 53 | Southern plateau | 0.00 | 100 |
| Missouri Valley | 1.30 | 54 | | | |
| Northern plateau | 1.40 | 68 | | | |
| North Pacific | 4.00 | 78 | | | |

Details as to excessive precipitation are given in Tables XIII and XIV.

The total snowfall at each station is given in Table II.

The accumulation of snow in the Sierra Nevada range on the route of the Central Pacific Railroad was very remarkable. The snow was 22 feet deep on the summit level at the beginning of the month, and drifts of 40 and 60 feet covered the fir trees on the mountain slopes. The heaviest snow was between Blue Canyon and Emigrant Gap, and snowslides were imminent. The map of normal distribution of annual snowfall seems to show that the maximum fall occurs along the Sierra opposite and a little north of San Francisco, as though the upper currents of air from the southwest, passing through the depression in the Coast Range near that city, carried the moisture northeastward to the neighborhood of Emigrant Gap.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere, as a whole, is very nearly constant from year to year, but the proportion received by the surface of the earth depends largely upon the absorption by the atmosphere, and varies with the distribution of cloudiness. The sunshine is now recorded automatically at 18 regular stations of the Weather Bureau by its photographic, and at 26 by its thermal effects. The results are given in Table XI for each hour of local, not seventy-fifth meridian, time. The cloudiness is determined by numerous personal observations at all stations during the daytime, and is given in the column of "average

cloudiness" in Table I; its complement or clear sky is given in the last column of Table XI.

COMPARISON OF SUNSHINE AND CLEAR SKY.

The sunshine registers give the *duration* of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. It should not be assumed that these numbers should agree, and for comparative purposes they have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentages of duration of sunshine is almost always larger than the observer's personal estimates of percentages of area

of clear sky; the average excess for January, 1895, is 5 per cent for photographic records, and 10 per cent for thermometric records. The details are shown in the following table:

Difference between instrumental and personal observations of sunshine for January, 1895.

| Photographic stations. | Instrumental. | Personal. | Difference. | Thermometric stations. | Instrumental. | Personal. | Difference. |
|------------------------|---------------|-----------|-------------|----------------------------|---------------|-----------|-------------|
| Denver, Colo. | 78 | 55 | 18 | Key West, Fla. | 79 | 65 | 14 |
| San Diego, Cal. | 66 | 58 | 8 | New York, N. Y. | 66 | 38 | 28 |
| Santa Fe, N. Mex. | 66 | 55 | 11 | Vicksburg, Miss. | 66 | 50 | 16 |
| Tucson, Ariz. | 66 | 50 | 16 | Norfolk, Va. | 65 | 53 | 10 |
| Kansas City, Mo. | 57 | 55 | 2 | St. Louis, Mo. | 62 | 59 | 3 |
| Bismarck, N. Dak. | 51 | 40 | 11 | San Francisco, Cal. | 61 | 44 | 17 |
| Dodge City, Kans. | 51 | 50 | 1 | Des Moines, Iowa. | 58 | 52 | 6 |
| Galveston, Tex. | 50 | 51 | -1 | New Haven, Conn. | 57 | 50 | 7 |
| Savannah, Ga. | 49 | 41 | 8 | Baltimore, Md. | 54 | 44 | 10 |
| Eastport, Me. | 44 | 36 | 8 | Philadelphia, Pa. | 54 | 38 | 16 |
| Cincinnati, Ohio. | 43 | 38 | 5 | Portland, Me. | 53 | 45 | 8 |
| Memphis, Tenn. | 40 | 40 | 0 | Marquette, Mich. | 51 | 37 | 14 |
| Washington, D. C. | 39 | 36 | 3 | Wilmington, N. C. | 51 | 37 | 14 |
| Helena, Mont. | 32 | 33 | -1 | Boston, Mass. | 49 | 40 | 9 |
| Cleveland, Ohio. | 34 | 28 | 6 | Chicago, Ill. | 46 | 42 | 4 |
| Spokane, Wash. | 24 | 18 | 6 | Detroit, Mich. | 46 | 37 | 9 |
| Portland, Oreg.* | 18 | 25 | -12 | New Orleans, La. | 43 | 41 | 2 |
| | | | | Salt Lake City, Utah. | 43 | 30 | 13 |
| | | | | Atlanta, Ga. | 42 | 39 | 3 |
| | | | | Louisville, Ky. | 42 | 33 | 9 |
| | | | | Little Rock, Ark. | 37 | 39 | -2 |
| | | | | Columbus, Ohio. | 32 | 28 | 4 |
| | | | | Rochester, N. Y. | 32 | 28 | 4 |
| | | | | Buffalo, N. Y. | 29 | 30 | -1 |
| | | | | Seattle, Wash. | 26 | 18 | 8 |
| | | | | Portland, Oreg.* | 23 | 25 | -2 |

The average excess for February, 1895, is 3 per cent for photographic records, and 12 per cent for thermometric records. The details are shown in the following table:

Difference between instrumental and personal observations of sunshine for February, 1895.

| Photographic stations. | Instrumental. | Personal. | Difference. | Thermometric stations. | Instrumental. | Personal. | Difference. |
|-----------------------------|---------------|-----------|-------------|-----------------------------|---------------|-----------|-------------|
| Tucson, Ariz. | 78 | 64 | 14 | Baltimore, Md. | 79 | 60 | 19 |
| Santa Fe, N. Mex. | 74 | 62 | 12 | New York, N. Y. | 79 | 51 | 28 |
| San Diego, Cal. | 68 | 66 | 2 | Boston, Mass. | 74 | 51 | 23 |
| Washington, D. C. | 68 | 61 | 7 | St. Louis, Mo. | 74 | 58 | 16 |
| Cincinnati, Ohio. | 64 | 65 | -1 | Detroit, Mich. | 73 | 54 | 19 |
| Denver, Colo. | 63 | 51 | 11 | New Haven, Conn. | 73 | 59 | 14 |
| Dodge City, Kans. | 58 | 50 | 8 | Norfolk, Va. | 71 | 70 | 1 |
| Helena, Mont. | 57 | 54 | 3 | San Francisco, Cal. | 69 | 62 | 7 |
| Savannah, Ga. | 55 | 51 | 4 | Chicago, Ill. | 67 | 59 | 8 |
| Memphis, Tenn. | 54 | 53 | 1 | Key West, Fla. | 67 | 49 | 18 |
| Salt Lake City, Utah*. | 50 | 37 | 13 | Marquette, Mich. | 67 | 38 | 29 |
| Kansas City, Mo. | 48 | 45 | 3 | Philadelphia, Pa. | 66 | 53 | 13 |
| Eastport, Me. | 48 | 42 | 6 | Portland, Me. | 64 | 46 | 18 |
| Galveston, Tex. | 47 | 52 | -5 | Des Moines, Iowa. | 62 | 39 | 23 |
| Spokane, Wash. | 46 | 36 | 10 | Atlanta, Ga. | 61 | 58 | 3 |
| Bismarck, N. Dak. | 45 | 47 | -2 | Louisville, Ky. | 57 | 51 | 6 |
| Cleveland, Ohio. | 45 | 47 | -2 | Columbus, Ohio. | 56 | 50 | 6 |
| Portland, Oreg.* | 36 | 37 | -11 | Wilmington, N. C. | 56 | 57 | -1 |
| | | | | Little Rock, Ark. | 54 | 41 | 13 |
| | | | | Salt Lake City, Utah*. | 54 | 37 | 17 |
| | | | | Buffalo, N. Y. | 47 | 30 | 17 |
| | | | | Rochester, N. Y. | 47 | 42 | 5 |
| | | | | Vicksburg, Miss. | 45 | 42 | 3 |
| | | | | Seattle, Wash. | 43 | 30 | 13 |
| | | | | New Orleans, La. | 41 | 40 | 1 |
| | | | | Portland, Oreg.* | 38 | 37 | 1 |

* Records kept by both registers.

WIND.

The prevailing winds for February, 1895, viz, those that were recorded most frequently at Weather Bureau stations, are shown in Table I.

The resultant winds, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart II, in connection with the isobars based on the same system of simultaneous observation; the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a wind of average velocity; these figures (or the ratio between them and the total number of observations in this month) indicate the extent to which winds from different directions counterbalanced each other.

Maximum wind velocities of 50 miles or more per hour were reported at regular stations of the Weather Bureau as

follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

| Stations. | Date. | Velocity. | Direction. | Stations. | Date. | Velocity. | Direction. |
|--------------------------|-------|-----------|------------|----------------------------|-------|-----------|------------|
| Amarillo, Tex. | 6 | 53 | n. | Detroit, Mich. | 20 | 80 | sw. |
| Do. | 7 | 52 | n. | Eastport, Me. | 8 | 79 | e. |
| Block Island, R. I. | 6 | 60 | e. | Hatteras, N. C. | 8 | 57 | nw. |
| Do. | 2 | 66 | w. | Do. | 9 | 50 | nw. |
| Fort Canby, Wash. | 10 | 50 | e. | Kittyhawk, N. C. | 8 | 58 | nw. |
| Do. | 11 | 68 | e. | Oklahoma, Okla. | 6 | 58 | e. |
| Do. | 12 | 64 | e. | Tacooah Island, Wash. | 10 | 58 | e. |
| Do. | 13 | 73 | se. | Titusville, Fla. | 15 | 72 | e. |
| Do. | 16 | 71 | se. | Woods Holl, Mass. | 5 | 57 | nw. |
| Chicago, Ill. | 20 | 51 | sw. | Do. | 8 | 70 | sw. |

No severe local storms were reported during February.

ATMOSPHERIC ELECTRICITY.

The statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

The dates on which reports of thunderstorms for the whole country were most numerous were: 1st, 11; 2d, 6; 22d, 9; 25th, 11. Thunderstorms were most numerous in Colorado, California, and Louisiana. The dates of thunderstorm occurrence were most numerous in: Florida, eight days; Colorado and Texas, five days.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed

to be the four days preceding and following the date of full moon, viz, from the 5th to the 13th, inclusive. On the remaining nineteen days of this month 480 reports were received, or an average of about 25 per day. The dates on which the reported number especially exceeded this average were: 14th, 97; 15th, 139; 23d, 65.

Auroras were reported by a large percentage of observers in Minnesota, Maine, Michigan, Montana, New Hampshire, North Dakota, and Wisconsin.

The dates of auroras were most frequent in: New Hampshire, 13; Wisconsin, 12; Minnesota, Montana, and Ohio, 10; Massachusetts and North Dakota, 9; Iowa and South Dakota, 8.